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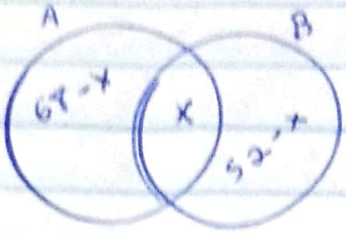
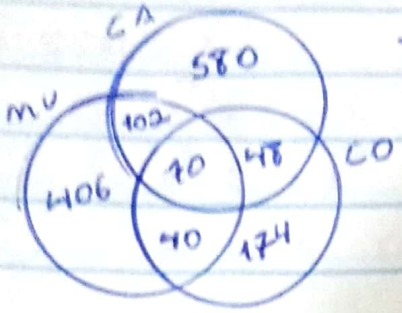
1) a)



$100\% = 68\% + 52\% - x$

$x = 20\%$

b)



$T = 2500$

$2500 - 580 - 174 - 406 - 102 - 48 - 40 - 70 = x$

$x = 2500 - 1420$

$x = 1080$

2) a) $A \cup B \rightarrow]5, 11]$

$A \cup B = \{x \in \mathbb{R} / 5 < x \leq 11\}$

b) $A \cap B \rightarrow [7, 9]$

$A \cap B = \{x \in \mathbb{R} / 7 \leq x \leq 9\}$

c) $A \cup (C \cap B)$

$C \cap B \rightarrow \emptyset$

$A \cup (\emptyset) \rightarrow]5, 9]$

$A \cup (\emptyset) = \{x \in \mathbb{R} / 5 < x \leq 9\}$

3)

a) V

b) V

c) F

d) F

4) a) $f(x) = x^2 + 1$ $\quad f(-x) = (-x)^2 + 1$

$x^2 + 1 = (-x)^2 + 1$

$x^2 = (-x)^2$

$0 = 0$ ✓ PAR

b) $g(x) = x^3/6$ $\quad g(-x) = (-x)^3/6$

$x^3/6 = (-x)^3/6$

$x^3 = -x^3$

$x = -x$ ✓ ImPAR

c) $h(x) = (x+1)^2$ $\quad h(-x) = ((-x)+1)^2$

$(x+1)^2 = ((-x)+1)^2$

$x^2 + 2x + 1 = (-x)^2 + (-x)2 + 1$

$2x = -2x$ NÃO

E

d) $\pi(x) = \sqrt[5]{x}$ $\quad \pi(-x) = \sqrt[5]{(-x)}$

$\sqrt[5]{x} = \sqrt[5]{(-x)}$

$\sqrt[5]{x} = -\sqrt[5]{x}$

$x^{(-1)} = -x$

$\frac{1}{x} = \frac{1}{x}$

$x = x$ ✓ ImPAR

e) $g(x) = \frac{x^4}{x^2+1}$ $\quad g(-x) = \frac{(-x)^4}{(-x)^2+1}$

$\frac{x^4}{x^2+1} = \frac{(-x)^4}{(-x)^2+1}$

$\frac{x}{x} = \frac{x}{x}$

$x = x$ ✓ PAR

5) $f(x) = (3+x)\cdot(2-x)$

a) $f(0) = (3+0)\cdot(2-0) \rightarrow 3\cdot 2 \rightarrow 6$

$f(-2) = (3+(-2))\cdot(2-(-2)) \rightarrow 1\cdot 4 \rightarrow 4$

$f(1) = (3+1)\cdot(2-1) \rightarrow 4\cdot 1 \rightarrow 4$

b) $f(a) = (3+a)\cdot(2-a) \rightarrow 6 - 3a + 2a - a^2 \rightarrow 6 - a - a^2$

$f(-a) = (3+(-a))\cdot(2-(-a)) \rightarrow 6 - 2a + 3a - a^2 \rightarrow 6 + a - a^2$

$f(a) - f(-a) \rightarrow 6 - a - a^2 - (6 + a - a^2) \rightarrow 6 - a - a^2 - 6 - a + a^2 \rightarrow -2a$

6) $f(x) = 3x^2 - x + 5 \qquad g(x) = -2x + 9$

a) $\dfrac{f(0) + g(1)}{f(1)} \rightarrow \dfrac{(3(0)^2 - (0) + 5) + (-2(1) + 9)}{3(1)^2 - (1) + 5} \rightarrow \dfrac{5 + 9 - 2}{3 - 1 + 5} \rightarrow \dfrac{12}{7}$

b) $g(x) = f(-3) + g(-4) \rightarrow (3(-3)^2 - (-3) + 5) + (-2(-4) + 9)$

$27 + 3 + 5 + 8 + 9$

52

$g(x) = 52$

$-2x + 9 = 52$

$x = \dfrac{52 - 9}{-2}$

$x = \dfrac{43}{2}$

6) $f(x) = m \cdot 4^x$ $\quad f(1) = 12$

a) $12 = m \cdot 4^1 \rightarrow m = 12/4 \rightarrow \boxed{m = 3}$

b) $f(2) = m \cdot 4^{(2)} \rightarrow f(2) = 3 \cdot 4^2 \rightarrow 3 \cdot 16 \rightarrow \boxed{f(2) = 48}$

7) a) $Y = \sqrt{x-2} \rightarrow x - 2 \geq 0 \rightarrow x \geq 2$

$D = \{x \in \mathbb{R} / x \geq 2\}$

b) $Y = \sqrt[3]{4x+1} \rightarrow x \in \mathbb{R}$

$D = \{x \in \mathbb{R}\}$

c) $Y = \dfrac{3x+1}{\sqrt{x-3}} \rightarrow x - 3 > 0 \rightarrow x > 3$

$D = \{x \in \mathbb{R} / x > 3\}$

d) $Y = \dfrac{\sqrt{x+1}}{x} \rightarrow x \neq 0 \;//\; x + 1 \geq 0 \rightarrow x \geq -1$

$D = \{x \in \mathbb{R} / x \neq 0 \text{ e } x \geq -1\}$

9) a) 1995, 1998, 1999, 2001, 2002, 2003

b) 1995, superior

c) 2009

d) 2005-2006, 2007-2008

e) $100 \cdot 70 \rightarrow 7000\ m^2 \rightarrow R\$ 1000$ $\quad 474 = R\$1000 \cdot X$

$X = 474\,000 / 7$

$X \approx 67\,714,28$

10) a) $Im = \{x \in \mathbb{R} / x \geq 0\}$

b) $Im = \{4\}$

c) $Im = \{x \in \mathbb{R} / x \leq 3\}$

d) $Im = \{x \in \mathbb{R} / x < 0\}$

11) $f(x) = x^2 - x - 2 \qquad g(x) = 1 - 2x$

a) $f \circ g \rightarrow (1-2x)^2 - (1-2x) - 2 \rightarrow 1^2 - 2(2x) + 4x^2 - 1 - 2x - 2 \rightarrow 1 - 4x + 4x^2 - 1 - 2x - 2$

$\boxed{4x^2 - 6x - 2}$

$g \circ f \rightarrow 1 - 2(x^2 - x - 2) \rightarrow 1 - 2x^2 + 2x + 4 \rightarrow \boxed{-2x^2 + 2x + 5}$

b) $f \circ g(-2) = 4(-2)^2 - 6(-2) - 2 \rightarrow 4 \cdot 4 + 12 - 2 \rightarrow \boxed{26}$

$g \circ f(-2) = -2x^2 - 2x + 5 \rightarrow -2(-2)^2 - 2(-2) + 5 \rightarrow -8 + 4 + 5 \rightarrow \boxed{1}$

c) $f \circ g(x) = 10 \qquad A = 4 \qquad \Delta = (-6)^2 - 4(4)(-12)$

$4x^2 - 6x - 2 = 10 \qquad B = -6 \qquad \Delta = 36 + 192$

$4x^2 - 6x - 12 = 0 \qquad C = -12 \qquad \Delta = 228$

$\sqrt{228} \rightarrow 228 \mid 2$
$114 \mid 2$
$57 \mid 3$
$19 \mid 19$
1

$x = \frac{-(-6) \pm \sqrt{228}}{2(4)} \qquad x' = \frac{6 + 2\sqrt{57}}{8} \rightarrow \frac{3 + \sqrt{57}}{4}$

$x'' = \frac{6 - 2\sqrt{57}}{8} \rightarrow \frac{3 - \sqrt{57}}{4}$

$D = \left\{ \frac{3 + \sqrt{57}}{4}, \frac{3 - \sqrt{57}}{4} \right\}$

12) a) $x = 6y - 4$

$6y = x + 4$

$y = \frac{x+4}{6}$

b) $x = \frac{5}{y+4}$

$x(y+4) = 5$

$xy + 4x = 5$

$xy = 5 - 4x$

$y = \frac{5}{x} - 4$

c) $x = \frac{2y-1}{y+3}$

$x(y+3) = 2y - 1$

$xy + 3x = 2y - 1$

$xy - 2y = -3x - 1$

$y(x-2) = -3x - 1$

$y = \frac{-3x-1}{x-2}$

13) $f(x) = 3x + 2 \qquad g(x) = 2x + a$

$f \circ g = 3(2x+a) + 2 \rightarrow 6x + 3a + 2$

$g \circ f = 2(3x+2) + a \rightarrow 6x + 4 + a$

$6x + 3a + 2 = 6x + 4 + a$

$3a - a = 4 - 2$

$2a = 2$

$\boxed{a = 1}$

14) $D = \{x \in \mathbb{R}\}$

$Im = \{y \in \mathbb{R} / y < 3\}$

a) V

b) F

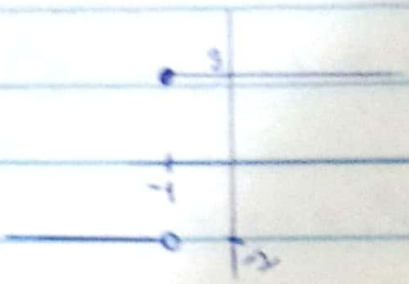
c) V

d) V

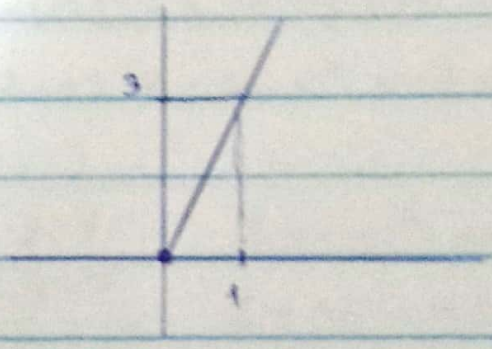
e) V

f) V

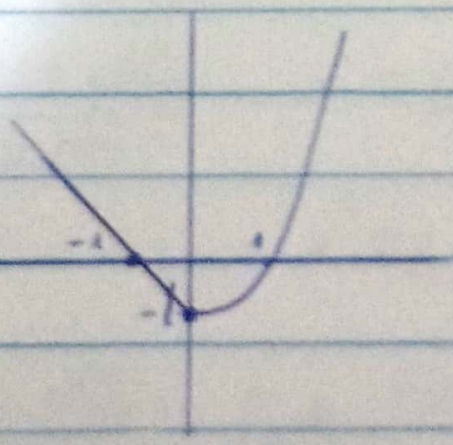
15) a)



b)



c)



(6) $f(x) = \frac{x-2}{x^2+4}$ $\quad g(x) = \frac{2x+3}{x+4}$

$$f(g(x)) = \frac{\left(\frac{2x+3}{x+4}\right) - 2}{\left(\frac{2x+3}{x+4}\right)^2 + 4} \rightarrow \frac{\frac{2x+3-2(x+4)}{x+4}}{\frac{(2x+3)^2 - 2(x+4)^2}{x+4}}$$

$$\frac{2x+3-2x-8}{4x^2+12x+9-2x^2-16x-32} \rightarrow x+3-\frac{1}{2}x-4-\frac{8}{x}+\frac{9}{x+4}$$

$$-\frac{5x+20}{8x^2+49x+73}$$

$$g(f(x)) = \frac{2\left(\frac{x-2}{x^2+4}\right)+3}{\left(\frac{x-2}{x^2+4}\right)+4} \rightarrow \frac{\frac{2x-4}{x^2+4}+3}{\frac{x-2+4x^2+16}{x^2+4}}$$

$$\frac{2x-4+3x^2+12}{x+14+4x^2}$$

$$\frac{3x^2+2x+8}{4x^2+x+14}$$